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Correlation Between Student's Curiosity and Science Literacy Skills with Science Learning Achievement in Elementary School

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ABSTRACT

This research is a quantitative correlation study using an ex-post facto design to determine the correlation between student curiosity and science literacy skills with science learning achievement at Muhammadiyah 2 Sidoarjo Elementary School. There is no revelation about the correlation between students' curiosity, science literacy skills, and learning achievement at the elementary school level, so researchers are interested in conducting this research at Muhammadiyah 2 Sidoarjo Elementary School, which has implemented the Minimum Competency Assessment system for its students. The population and sample in this study were 86 students in 6th grade at Muhammadiyah 2 Sidoarjo Elementary School. Research data obtained using questionnaires and documents. Data analysis techniques used is multiple correlation analysis. Based on the results of the study obtained the conclusion there is a correlation between curiosity and science literacy skills of students with student's science learning achievement.

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1. INTRODUCTION

Curiosity is an encouragement felt by someone to be able to know something. Curiosity includes ways of thinking, actions, and deeds that illustrate interest and curiosity in things that are observed, heard, and pursued in more depth. Through their curiosity, people will be happy and enthusiastic to learn new things that can make them better and more developed (Silvia & Ropida, 2022). Curiosity is the foundation for learners during learning (Ameliah, 2016). Curiosity makes learning not boring because students are happy to show their enthusiasm to learn new things taught by the teacher to explore their ignorance. Developing learners' curiosity can be done by educators through interesting learning design every meeting. Interesting learning is also one of the essential factors to develop learners' curiosity. The curiosity of students when doing learning can be measured through 3 indicators, which are 1) Desire to learn something new, 2) Strong attitude to learn something, and 3) Interested in new things (Priyo, 2018). If students have fulfilled these three indicators, students can be categorized as students who have curiosity in their learning.

Learners who are interested in learning will make it easier to achieve the learning objectives that have been set. Current learning goals are oriented towards rapid technological transformation and the development of new literacy skills. the Indonesian government promotes literacy activities in all schools throughout Indonesia. Literacy is an ability that involves learned knowledge, existing culture, and personal experience to be constructed into new knowledge. (Abidin *et al*., 2017). Literacy skills are divided into 6 types, which are literacy in reading and writing, numeracy literacy, science literacy, digital literacy, financial literacy, and cultural and civic literacy. Among the six types of literacy, science literacy is now a hot topic of study in education (Fensham, 2018).

Science literacy is the ability to use scientific understanding, recognize questions, and make conclusions based on existing symptoms in order to learn and make decisions about nature and how it changes (Anjarsari, 2014). Science literacy can give a great insight for students, this is according to DeBoer's opinion that through science literacy students can have a broad understanding related to natural science (DeBoer, 2000).

Based on those statements, science literacy can be defined as an important skill to be developed in learners even from elementary school ages. In elementary schools, science literacy skills are integrated in the subject of Natural Sciences. Science is a set of knowledge that discusses natural phenomena arranged in a coherent manner. To measure the extent of science literacy skills of students can use indicators of science literacy skills. The indicators used refer to the indicators of science literacy skills from PISA in 2013 (OECD, 2019). The indicator measurements used are (1) explaining phenomena scientifically, (2) designing and evaluating scientific investigations, and (3) interpreting data and evidence scientifically. If the three competency indicators above are fulfilled, it can be said that the students have literate science well.

The measurement of science literacy skills is routinely carried out by PISA every 3 years on students in various countries. Since 2000, Indonesia has participated the program until now. In 2012, the science literacy results of students in Indonesia were 382 points which at that time ranked 64th out of 65 participating countries (OECD, 2014) In 2015, the science literacy results of Indonesian students increased by 403 points and ranked 64 out of 72 participating countries (OECD, 2016). Based on the PISA assessment, it illustrates that the science literacy of students in Indonesia is still in the low category. The results obtained can be caused by several factors, including the lack of proficiency of students in working on critical

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thinking questions and attitudes and skills in integrated thinking which are still classified as bad (Nadhifatuzzahro *et al*., 2015).

The problem can actually be fixed through the implementation of the habit of asking questions and reading. Curiosity can be developed through questioning and reading activities because there will be a thirst for knowledge and experience as these activities are carried out. Through a desire for knowledge and experience, students will carry out literacy activities which will have an impact on their learning achievement. This is because learning achievement is the impact of learning activities (Winkel, 1997).

Learning achievement is usually presented in a student's report card. The contents include the achievements of students in their learning efforts during the learning process. According to Nasution, learning achievement is the integrity of thoughts, feelings, and actions that have been achieved by a person (Nasution, 1987). Learning achievement is said to be achieved if it has fulfilled three aspects, including cognitive (knowledge), affective (attitude), and psychomotor (skills) aspects. Otherwise, if the three targets are not satisfactory, it means that learning achievement is still not achieved properly.

In Armas's research, it shows that there is a correlation between science literacy skills and students' learning achievement with a medium correlation level. (Ratna Khaerati Armas & Syahrir, 2019). In Muhammad's research, the correlation between science literacy and students' curiosity obtained medium results (Syarifah Novianur Muhammad *et al*., 2018). Different with the others, Nehru's research states that there is no correlation between curiosity and students' learning achievement (Nehru & Erika Irianti, 2019). This causes a gap that makes researchers want to know the relationship between the three variables.

Based on the results of observations at Muhammadiyah 2 Sidoarjo elementary school, the school has implemented science literacy-based learning by using the Minimum Competency Assessment Question type as an exam question. At Muhammadiyah 2 Sidoarjo elementary school, the Minimum Competency Assessment is only used as a measurement of learning outcome in science subjects, but there is no specific measurement of science literacy skills. Measurement of students' curiosity is also still not revealed in the school, there were only report cards as the outcome of students' learning achievements each semester so this research needs to be done to reveal the relationship between Competency Assessment Question results with science literacy skills and students' learning achievements. Based on those observations, it can be concluded that the purpose of this study is to reveal the relationship that happens between 1) curiosity with science learning achievement, 2) science literacy skills with science learning achievement, and 3) curiosity and science literacy skills simultaneously with science learning achievement in 6th grade students at Muhammadiyah 2 Sidoarjo Elementary School.

2. METHODS

The method used in this research is a quantitative approach, because the research data is in the form of numbers which are then analyzed using statistics. The type of research is ex post facto, because it does not give treatment to the sample of research and the type of correlation is a causal correlation, namely a cause-and-effect relationship, so that there are independent (affecting) and dependent (affected) variables. This research design is a correlational relationship study because this research was conducted to determine the relationship between two or more variables. The research design can be seen in **Figure 1.**

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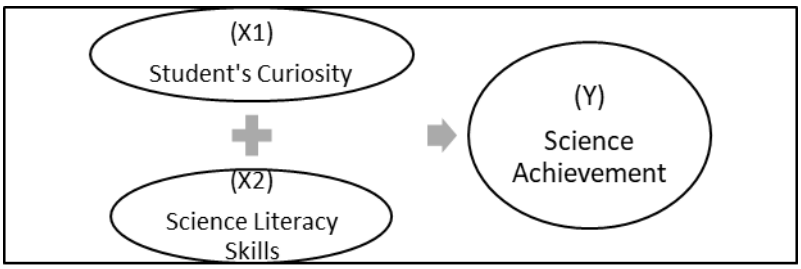

Figure 1. Research Design

The population and sample of this study were all 6th grade students of Muhammadiyah 2 Sidoarjo Elementary School in the academic year 2022/2023 consisting of 3 classes with a total of 86 students. The whole population was used as a sample because this study used a saturating sampling technique to determine the research sample.

Data collecting techniques in this study used questionnaires and documents. The questionnaire was used as an instrument to measure the curiosity of students. The questionnaire was taken from Priyo's research using a Likert scale (Priyo, 2018). The Grids for Students' Coriosity Questionnaire is shown in **Table 1**. To measure the variable of science literacy ability of students taken from the School Examination scores of science subjects that use AKM type questions on the measurement that has been adapted to the indicators of science literacy proposed by Gormally (Gormmally et al., 2012). meanwhile to measure the learning achievement variable taken from the even semester report card documents on science subjects.

Table 1. Grids for Students' Curiosity Questionnaire (Priyo, 2018).

Grids for Students' Curiosity Questionnaire	
Curiosity Indicator	**Curiosity Sub-Indicator**
1. Desire to learn something new	1.1 Try even if it is wrong
	1.2 Solving problems
	1.3 Think actively
2. A strong attitude to know something	2.1 Spirit
	2.2 Never give up
	2.3 Discipline
3. Interested in new things	3.1 Search for information
	3.2 Reading
	3.3 Asking questions

Table 2. Science Literacy Ability Test Grids (Gormmally *et al*., 2012).

Literacy Ability Indicator	**Literacy Ability Sub-Indicator**
1. Explaining phenomena scientifically	1.1 Recall and apply appropriate scientific knowledge
	1.2 Identify, use, and produce clear models and representations
	1.3 Explain the potential implications of scientific knowledge for society
2. Design and evaluate scientific inquiry	2.1 Propose a way to scientifically explore the given question
	2.2 Evaluate how to scientifically explore a given question

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	2.3 Describe and evaluate the various methods used by scientists to determine the validity and objectivity of data and the generality of explanations
3. Interpreting data and evidence scientifically	3.1 Transforming data from one representation to another representation
	3.2 Analyzing and interpreting data and drawing appropriate conclusions

This study using inferential statistical data analysis techniques, which is by multiple correlation tests with several pre-requisite tests, including normality tests and homogeneity tests. The normality test in this study using the Kolmogrov-Smirnov test because the number of samples is more than 50, with a significance level of 5% or 0.05, with the condition that if the significance value > 0.05, then the distribution is normal and if the significance value < 0.05 the distribution is not normal. The homogeneity test is used to determine the similarity of variants in the research population, if the significance > 0.05 then the data is homogeneous, if the significance < 0.05 then the data is not homogeneous. Correlation Coefficient Interpretation Criteria shown in **Table 3**.

Table 3. Correlation Coefficient Interpretation Criteria (Sugiyono, n.d.).

Coefficient Interval	Level of Correlation
0,00 – 0,199	Very low
0,20 – 0,399	Low
0,40 – 0,599	Medium
0,60 – 0,799	Strong
0,80 – 1,000	Very strong

3. RESULTS AND DISCUSSION

3.1. Frequency Distributions of Data

Based on the results of research by distributing curiosity questionnaires to all 6th grade students at Muhammadiyah 2 Sidoarjo Elementary School, the results of the frequency distribution of curiosity are shown in **Table 4** and **Figure 2.**

Table 4. Frequency Distribution of Student's Curiosity

Interval	Criteria	Frequency	Presentage
0-20,99	Very Low	0	0%
21-40,99	Low	0	0%
41-60,99	Medium	1	1,2%
61-80,99	Strong	32	37,2%
81-100	Very Strong	53	61,6%
Total		86	100%

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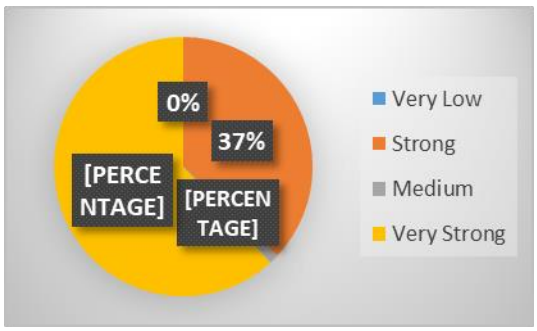

Figure 2. Frequency Distribution Diagram of Student Curiosity

Factors that caused low curiosity of students According to Artinta, including 1) Teacher motivation that makes learners' self-esteem increase, 2) Teacher apperception that makes students encouraged to achieve learning objectives, 3) Exploration of questions by the teacher to raise curiosity from students, 4) The spirit of learning from students, the greater the enthusiasm of learning students, the greater the curiosity to learn many things, 5) Learning interests that influence students to carry out learning activities, and 6) Gender, usually women are more curious than men (Artinta & Fauziyah, 2021). Around 62% of students at Muhammadiyah 2 Sidoarjo Elementary School are in the very strong curiosity category and 37% are in the strong category. This means that the factors that cause low curiosity at Muhammadiyah 2 Sidoarjo Elementary School do not occur so much, this is also evidenced by the results of research showing only 1% of students whose curiosity is in the moderate category. The distribution of learners' couriosity per indicator and its diagram can be seen in **Table 5** and **Figure 3**.

Table 5. Distribution of Learners' Curiosity per Indicator

No.	Curiosity Indicator	Criteria			
		Very Strong	Strong	Low	Very Low
1.	Desire to learn something new	39,7%	43,8%	13,6%	2,9%
2.	A strong attitude to know something	59,9%	32,8%	6,4%	0,9%
3.	Interested in new things	35,5%	45,7%	13,9%	4,9%

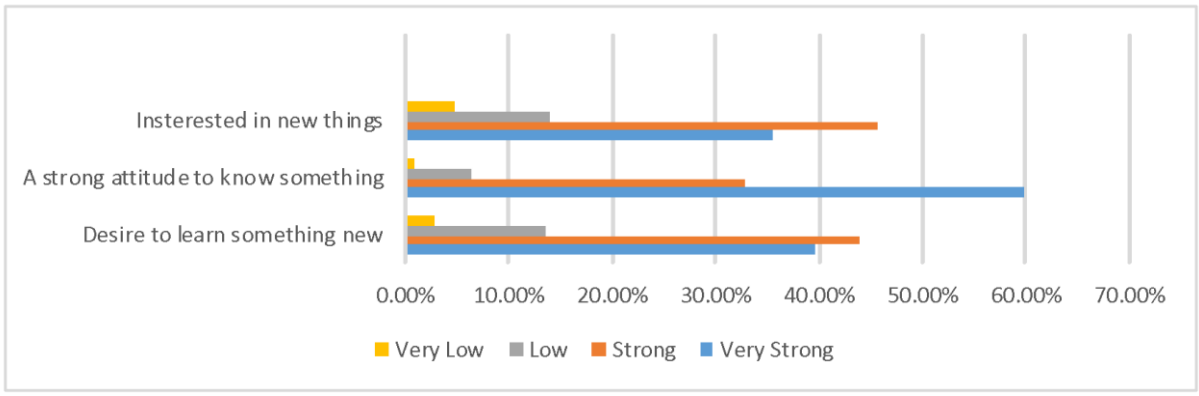

Figure 3. Distribution of Learner's Curiosity per Indicator Diagram

Based on the results of the study, the curiosity of students at Muhammadiyah 2 Sidoarjo Elementary School is higher in the strong attitude indicator to know something with a percentage of 60% of students in the very strong category. The attitude shown by students

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includes enthusiasm, perseverance, and discipline in participating in learning activities in science subjects. According to Loewenstein, curiosity can be observed through his enthusiasm for learning (Loewenstein, 1994). Students who are excited about learning will be interested in new things that are being learned. Meanwhile, students who are not excited about learning are more likely to be silent and passive even though they do not know about the material being learned.

The next indicator of curiosity that is quite a lot owned by students at Muhammadiyah 2 Sidoarjo Elementary School is the indicator of the desire to learn something new. With a percentage of 39.7% in the very strong category and 43.8% in the strong category, it can be interpreted that 83.5% of 6th grade students of Muhammadiyah 2 Sidoarjo Elementary School have an attitude of continuing to try even though they are wrong, willing to work on problems with their own initiative, and able to think actively in their learning. According to Hopkins and Craig, curiosity is indeed described in the enthusiasm to search for information such as asking questions, reading, and exploring many things (Hopkins & Craig, 2015).

The indicator of being interested in new things obtained a percentage of 35.5% in the very strong category and 45.7% in the strong category. This can be interpreted that 81.2% of 6th grade students of Muhammadiyah 2 Sidoarjo Elementary School already have a good attitude in seeking information, reading information, and asking teachers or friends. This is in accordance with Puspitasari's opinion that students who like to read books and want to look for learning references from other sources are students who have high curiosity (Puspitasari, 2015). The frequency distribution of science literacy ability can be seen in **Table 6** and **Figure 4**.

Table 6. Frequency Distribution of Science Literacy Ability.

Interval	Criteria	Frequency	Presentage
<55	Low	0	0%
55-70	Medium	0	0%
70-85	Good	9	10,4%
85-100	Very Good	77	89,6%
Total		**86**	**100%**

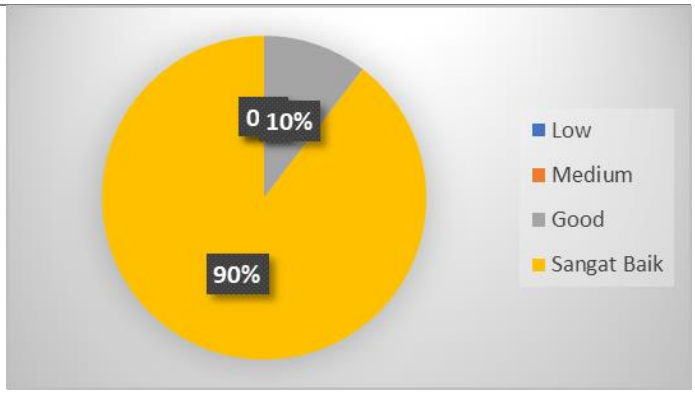

Figure 4. Science Sciences Skills Distribution

Students' science literacy skills can be seen through three indicators, which are the ability to explain phenomena scientifically, evaluate and design investigations scientifically, and scientifically interpret data and evidence (OECD, 2019). The science literacy skills of students in this study are reviewed from their ability to solve Minum Competency Assessment-based science literacy questions. The factors causing students' low mastery in solving science literacy questions include 1) Learners rarely do the questions, 2) Learners do not understand

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the terms of some problems, 3) Learners learn more by memorizing rather than understanding concepts (Rusilowati et al., 2016). The frequency distribution of Science Learning Achievement and its diagram can be seen in **Table 7** and **Figure 5**.

Table 7. Frequency Distribution of Science Learning Achievement

Interval	Criteria	Frequency	Presentage
<60	Low	0	0%
61-75	Medium	0	0%
76-89	Good	13	15,1%
>90	Very Good	73	84,9%
Total		**86**	**100%**

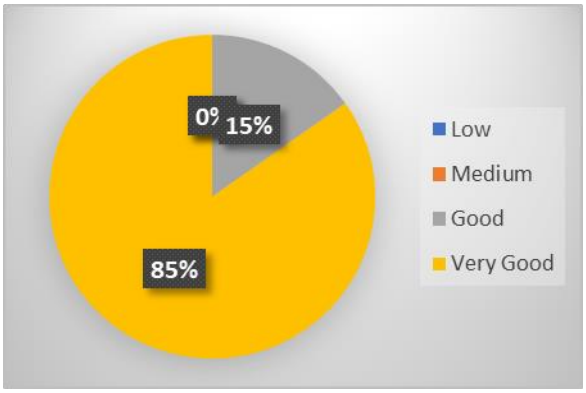

Figure 5. Frequency Distribution of Science Learning Achievement Diagram

From the table 7 results of the frequency distribution of science learning achievement in 86 students, a percentage of 15.1% was obtained in the good category and 84.9% in the very good category. Learning achievement is the result of learning efforts achieved by students in a certain time period which is recorded in the school report book. Based on the results of the study, the learning achievement of students at SD Muhammadiyah 2 Sidoarjo falls into the good and very good categories.

Factors that can influence student achievement can be divided into 2, namely internal factors and external factors. Internal factors are factors that come from the learners themselves which include 1) Physiological factors, in this factor the health of the student's body such as the condition of the body while in class or the function of the five senses during learning also plays a role in the ability of students to capture learning material at school. If the students' body health is good, their learning achievement tends to be good, otherwise if the students' body health is poor, their learning achievement can be disrupted, 2) Psychological factors, in this factor the intelligence, attitudes, and motivation of students also affect how students carry out their learning activities at school. Intelligence alone without a good attitude and motivation to learn cannot maximize learning achievement so that these three things must exist so that students' learning achievement is good (Winkel, 1997).

External factors are things from outside students that also influence their learning achievement. External factors that influence students' learning achievement include 1) Family environment factors, in this factor the socio-economic conditions of the family as well as education and family attention affect the condition of students. Learners whose family environment is good tend to pay more attention to how their children's education is being pursued, provide the facilities needed for their children's learning, and provide motivation so

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that their children are more enthusiastic about learning, 2) School environmental factors, in this factor infrastructure facilities, teacher competence, as well as the curriculum and methods used in schools that affect student achievement. Schools that have complete infrastructure facilities will provide a variety of experiences for students. Schools that have teachers with good competence will also choose the right curriculum and methods to apply to students so that their learning achievements are also good, 3) Community environmental factors, a good environment will also affect the learning performance of students because usually the surrounding community will participate and support ongoing educational activities (Thaib, 2013).

Learning achievement is different between one and another student. This is because learning achievement is a real skill in students that is influenced by the interaction between students with themselves and with their environment. Students who interact well with both of these things will achieve good achievement, otherwise if there is one or both of these interactions that are not good, it will affect their learning achievement as well (Salsabila & Puspitasari, 2020).

3.2 Pre-requisite Test

The pre-requisite tests used in this study are normality test and homogeneity test. Normality test is used to determine whether the data distribution is normally distributed or not. The normality test used is the Kolmogrov-Smirnov test because in general this test is suitable for measuring data above 50 samples specifically. The result of the Normality Test can be seen in **Table 8**. The basis for making normality test decisions using Kolmogrov-Smirnov is as follows:

If the significance value > 0.05 then the data is normally distributed
If the significance value <0.05 then the data is not normally distributed

Table 8. Normality Test Results

One-Sample Kolmogorov-Smirnov Test	
N	86
Asymp. Sig. (2-tailed)	.153[c]

Based on table 8 on the results of the normality test, the significance value of Asym. Sig (2-tailed) of 0.153 is greater than 0.05. When viewed from the basis for decision making in the Kolmogorov-sminorv normality test, the conclusion is that the data is normally distributed.

Homogeneity test is a test used to determine the similarity of variants in the research population. This was done because this study used a sample of 3 classes. The results of the homogeneity test that has been carried out are obtained a significance value of 0.138> 0.05 which means that the research data population is homogeneous, the results of the homogeneity test can be seen in **Table 9**.

Table 9. Homogeneity Test Results

Levene Statistic	df1	df2	Sig.
1.863	2	83	.138

3.3 Correlation between Student's Curiosity and Science Literacy Skills with Science Learning Achievement

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In this study, hypothesis testing was carried out by testing the correlation to answer the hypothesis. Hypothesis testing serves to determine the correlation between student curiosity (X1) and science literacy skills (X2) with science learning achievement (Y), with the following decision-making basis:

H1: If the significant value < 0.05 and the pearson correlation value > 0.05: There is a significant correlation.

H0: If the significant value > 0.05 and the pearson correlation value < 0.05: There is no significant correlation.

The result of the Multiple Correlation Hypothesis Test can be seen in **Table 10**.

Table 10: Multiple Correlation Hypothesis Test Results

Variable	Sig. F Change Value	Significance Value	R Value	Description
X1X2-Y	0,000	0,05	0,584	There is a significant correlation

Based on table 10, the correlation results of the variables of Curiosity (X1) and Science Literacy (X2) simultaneously with Science Learning Achievement (Y) there is a significant correlation. This can be seen from the Sig. F Change = 0.000 <0.05 with an R value of 0.584 which indicates that the correlation value of students' curiosity and science literacy skills with science learning achievement is moderately correlated with a positive relationship direction. It is concluded that the hypothesis H0 is rejected and H1 is accepted, which means that there is a relationship between students' curiosity and science literacy skills simultaneously with science learning achievement.

Curiosity is a desire to obtain certain information even if no reward is promised (Raharja & Wibhawa, 2018). This is because curiosity is coming from students themselves, which is then followed by the presence of a sense of enthusiasm in searching and exploring as much information as possible to answer their curiosity. Through curiosity, learners can gain insight into phenomena that attract their attention. Science literacy according to PISA is the ability to implement their knowledge to recognize questions, compile new knowledge, provide scientific descriptions, draw conclusions based on scientific evidence, and the ability to improve reflective thinking so that they are able to participate in passing issues and views related to science (OECD, 2019). Science literacy is an ability that attaches itself to each person. This ability is based on the ability to gather information and make decisions. Science literacy skills can help learners analyze and explain problems in their lives (Zuriyani E, 2017).

Based on the research results and the definitions, it can be illustrated that through curiosity, learners seek more detailed information related to a subject matter. The search for information is carried out by using their science literacy skills so that students get broader information. Through this information, students can complete each problem and question submitted by the teacher so that it has an impact on their learning achievement. It is concluded that the curiosity and science literacy skills of students have a relationship with students' science learning achievement. If they have higher curiosity and science literacy skills, they will have better science learning achievement.

4. CONCLUSION

Based on the results of research and data analysis that has been done, it is concluded that there is a relationship between curiosity and science literacy skills simultaneously with students' science learning achievement. The more students' curiosity and science literacy skills are, the higher the science learning achievement they get.

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